

**WE CLAIM:**

1. A method for producing a dental prosthesis comprising:
  - obtaining three-dimensional digital data relating to a patient's dentition;
  - designing a virtual prosthesis for said dentition using said three-dimensional digital data;
  - transmitting digital data corresponding to said virtual prosthesis to an automated prototyping system;
  - producing a prototype of said dental prosthesis with said automated prototyping system, said prototype made of a material that can be ablated;
  - covering at least said prototype with a hardening material and removing said prototype from within said hardening material to produce a mold for said dental prosthesis;
  - casting said dental prosthesis by filling said mold with a metal and removing said hardening material.
2. A method as claimed in claim 1, further comprising designing virtual conduits and reservoirs to be produced with said prototype of said dental prosthesis and used in said casting said dental prosthesis.
3. A method as claimed in claim 2, wherein said step of designing comprises simulating metal flow and crystallisation in said mold to determine a simulated structure of said prosthesis, and said virtual conduits and reservoirs are positioned on said prosthesis using said simulation to minimise a quantity of metal needed to produce said prosthesis while improving a metal flow in order to fill completely said prosthesis during said casting.
4. A method as claimed in claim 3, wherein said virtual conduits and reservoirs are positioned to support multiple patterns in a desired casting position, provide

passageways for fluid elimination, and form lines through which molten metal enters said mold.

5. A method as claimed in claim 2, further comprising designing a virtual casting mold container, wherein said virtual conduits and reservoirs are configured on said virtual casting mold container.
6. A method as claimed in claim 5, wherein said producing a prototype further comprises producing said prototype in one piece.
7. A method as claimed in claim 1, wherein said three-dimensional digital data is acquired by scanning said dentition directly in a patient's mouth.
8. A method as claimed in claim 3, wherein said simulation is optimised by considering fluid and thermal dynamic properties of a chosen metal alloy.
9. A method as claimed in claim 2, wherein each of said virtual conduits and reservoirs is marked to identify it.
10. A method as claimed in claim 5, wherein said virtual casting mold container is one of marked and shaped to indicate an optimal orientation when said prototype is placed in a casting oven.
11. A method as claimed in claim 1, wherein said designing a virtual prosthesis further comprises using a digital library of predefined investment trees.
12. A method as claimed in claim 1, wherein said designing a virtual prosthesis further comprises creating an investment tree using a tree edition software.
13. A method as claimed in claim 1, wherein said prototype is made of wax.

14. A method of manufacturing a pattern of a dental prosthesis from a wax material, comprising the steps of:

(a) forming a model of a patient's dentition including surfaces corresponding to the dental structure nearby the location that the dental prosthesis is to be placed in the mouth of a patient;

(b) scanning said surfaces of the model to collect three dimensional digital data corresponding to the said surfaces;

(c) displaying on a monitor screen of computer aided design equipment an image of a proposed dental prosthesis based, at least in part, on the collected three dimensional digital data corresponding to said surfaces;

(d) with the aid of said computer aided design equipment, modifying said image so that said image displayed on the monitor screen substantially corresponds to the dental prosthesis to be manufactured;

(e) collecting the three dimensional digital data substantially corresponding to said image of said dental prosthesis to be manufactured and transmitting said three dimensional digital data of said image of said dental prosthesis to be manufactured to automated prototyping equipment; and

(f) using the automated prototyping equipment making from a wax material the pattern of said dental prosthesis to be manufactured based upon said three dimensional digital data substantially corresponding to said image of said dental prosthesis to be manufactured.

15. The method of Claim 14 where the pattern has marginal edges that are at least 3/4 of a millimetre from margins of an individual tooth structure to which the dental prosthesis is to be attached.

16. The method of Claim 15 where, after step (f), the marginal edges of the pattern are manually adjusted to compensate for the specific configuration of said individual tooth structure by adding wax material to said edges.

17. A method of manufacturing a dental prosthesis, comprising the steps of:

(a) forming a model of a patient's dentition including surfaces corresponding to the dental structure nearby the location that the dental prosthesis is to be placed in the mouth of a patient;

(b) scanning said surfaces of the model to collect three dimensional digital data corresponding to the said surfaces;

(c) displaying on a monitor screen of computer aided design equipment an image of a proposed dental prosthesis based, at least in part, on the collected three dimensional digital data corresponding to said surfaces;

(d) with the aid of said computer aided design equipment, modifying said image so that said image displayed on the monitor screen substantially corresponds to the dental prosthesis to be manufactured;

(e) collecting the three dimensional digital data substantially corresponding to said image of said dental prosthesis to be manufactured and transmitting said three dimensional digital data of said image of said dental prosthesis to be manufactured to automated prototyping equipment; and

(f) using the automated prototyping equipment making from a wax material the pattern of said dental prosthesis to be manufactured based upon said three dimensional digital data substantially corresponding to said image of said dental prosthesis to be manufactured, and

(g) using said pattern in the lost wax investment casting process manufacturing said dental prosthesis.

18. The method of Claim 17 where the pattern has marginal edges that are at least  $\frac{3}{4}$  of a millimetre from margins of an individual tooth structure to which the dental prosthesis is to be attached.

19. The method of Claim 18 including, after step (f) and prior to step (g), manually adjusting the marginal edges of the pattern to compensate for the specific

configuration of said individual tooth structure by adding wax material to said edges.

20. A method of manufacturing a pattern of a dental prosthesis from a wax material, comprising the steps of (a) forming a model of a patient's dentition including surfaces corresponding to the dental structure nearby the location that the dental prosthesis is to be placed in the mouth of a patient, (b) creating three dimensional digital data corresponding to the said surfaces, and based on said data corresponding to the said surfaces, creating three dimensional digital data substantially corresponding to the dental prosthesis to be manufactured, (c) transmitting said three dimensional digital data of said dental prosthesis to be manufactured to automated prototyping equipment, and (d) using the automated prototyping equipment making from a wax material the pattern of said dental prosthesis to be manufactured based upon said three dimensional digital data of said dental prosthesis.
21. The method of Claim 20 where the pattern has marginal edges that are at least  $\frac{3}{4}$  of a millimetre from margins of an individual tooth structure to which the dental prosthesis is to be attached.
22. The method of Claim 21 where, after step (d), the marginal edges of the pattern are manually adjusted to compensate for the specific configuration of said individual tooth structure by adding wax material to said edges.
23. A method of manufacturing a dental prosthesis, comprising the steps of (a) forming a model of a patient's bite registration including surfaces corresponding to the dental structure nearby the location that the dental prosthesis is to be placed in the mouth of a patient, (b) creating three dimensional digital data corresponding to the said surfaces, and based on said data corresponding to the said surfaces, creating three dimensional digital data substantially corresponding

to the dental prosthesis to be manufactured,(c) transmitting said three dimensional digital data of said dental prosthesis to be manufactured to automated prototyping equipment, (d) using the automated prototyping equipment making from a wax material the pattern of said dental prosthesis to be manufactured based upon said three dimensional digital data of said dental prosthesis, and (e) using said pattern in the lost wax investment casting process manufacturing said dental prosthesis.

24. The method of Claim 23 where the pattern has marginal edges that are at least 3/4 of a millimetre from margins of an individual tooth structure to which the dental prosthesis is to be attached.

25. The method of Claim 23 including, after step (d) and prior to step (e), manually adjusting the marginal edges of the pattern to compensate for the specific configuration of said individual tooth structure by adding wax material to said edges.

26. The pattern of a dental prosthesis made from a wax material in accordance with the method of Claim 20.

27. The dental prosthesis made in accordance with the method of Claim 22.